

# The Incidence of Acute Rheumatic Fever in a Suburban Area of Los Angeles

## A Ten-Year Study

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*The incidence of in-hospital cases of acute rheumatic fever in residents of the San Fernando Valley section of Los Angeles (population 1,096,000) from 1971 through 1980 was 0.21 per 100,000 population for all ages and 0.63 per 100,000 for 5 to 17 year olds, both among the lowest ever reported in the world literature. Nevertheless, minority group patients had five times the risk of a white patient for acute rheumatic fever developing and a greater than 20-fold increase in the risk for the development of acute rheumatic fever with carditis. Unexpectedly, a low 30% of cases (8/27) had carditis either alone or with other major criteria, while a high 59% (16/27) had polyarthritis as the only major manifestation. This suggests the possibility of false-positive cases based on polyarthritis as the only major manifestation, and that an incidence of acute rheumatic fever may have been reached that is so low that "background" cases are a significant proportion of all cases.*

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The incidence of acute rheumatic fever has been decreasing in the United States since the beginning of the century.<sup>1,2</sup> The incidence of streptococcal pharyngitis has not declined at the same rate.<sup>3</sup> For many physicians, the primary reason for the evaluation of pharyngitis in general and for the treatment of streptococcal pharyngitis is to prevent acute rheumatic fever. A sore throat is among the most frequent reasons for a visit to a primary care physician's office,<sup>4</sup> and because a significant portion of our nation's outpatient health dollars is thus spent in the evaluation and treatment of pharyngitis, it behooves us to examine more closely the current incidence of acute rheumatic fever.

The major studies on the subject cover the period of the 1960s.<sup>5-7</sup> Since 1981 a new wave of studies has been published with more recent data, reporting rates of acute rheumatic fever differing from each other by a factor of 40, but all showing a remarkable lowering of the disease incidence.<sup>8-12</sup> Additional data from different parts of the country and different patient populations are needed to assist in evaluating acute rheumatic fever from a national perspective. We undertook a ten-year study of acute rheumatic fever in the San Fernando Valley, a largely suburban area of Los Angeles.

### Patients and Methods

We studied the records of all 24 acute care hospitals in the San Fernando Valley from 1971 through 1980 and reviewed all cases with the International Classification of Diseases codes of acute rheumatic fever, polyarthritis or Sydenham's chorea. In addition, we studied the records of Childrens Hospital of Los Angeles, UCLA (University of California, Los Angeles) Medical Center and Los Angeles County-University of Southern California Medical Center, all nearby major centers to which patients in the study area may be referred. The San Fernando Valley is a major population center, 85% of which is part of the city of Los Angeles. If it were a city itself, the San Fernando Valley would be the second largest city in California and the seventh largest in the nation.<sup>13</sup> It is defined as the San Fernando Valley section of the city of Los Angeles, as well as the cities of San Fernando and Burbank. The average yearly population for the study period was 1,096,051. Some hospitals could not provide data for the entire period, so the proportion of all acute care hospital beds that were included in the study was determined. Incidence data are adjusted accordingly to correct for incomplete participation. All included cases fulfilled the revised Jones criteri-

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# ACUTE RHEUMATIC FEVER

TABLE 1.—Incidence of Cases of Acute Rheumatic Fever (Primary and Recurrent Attacks) Treated in Hospital in Major Studies in Continental United States

Location and Years of Study	Annual Population Base	Overall Rate All Ages/100,000	Age-Specific Rate Per 100,000
Rochester, Minn, 1950-1964	37,000	9.5	35.0 (5-14 yr olds)
City of Baltimore, Md, 1960-1964	939,000	4.6	15.6 (5-19 yr olds)
Navajo Reservation (Arizona, New Mexico, Utah), 1962-1977	115,000	12.4	20.9 (5-19 yr olds)
Metropolitan Nashville, Tenn, 1963-1969	429,000	6.7	16.7 (5-19 yr olds)
State of Mississippi, 1964-1973	1,780,000	1.9	4.6 (5-19 yr olds)
Rochester, Minn, 1965-1978	50,000	3.0	7.1 (5-14 yr olds)
Fairfax County, Va, 1970-1980	526,000	...	1.14 (0-18 yr olds)
San Fernando Valley of Los Angeles, Calif, 1971-1980	1,090,000	0.21	0.63 (5-17 yr olds)
State of Rhode Island, 1976-1980	930,000	0.07	0.23 (5-17 yr olds)
Memphis-Shelby County, Tenn, 1977-1981	777,000	0.64	1.88 (5-17 yr olds)

a.<sup>14</sup> Only those patients having acute rheumatic fever residing in the San Fernando Valley are included in the incidence data. All cases reviewed, including those of patients residing outside of the area, are evaluated for the pattern of disease.

## Results

We obtained the records of 89.4% of all hospital bed-years during the period of 1971 through 1980 for the San Fernando Valley area. This includes 87.7% of all adult hospital bed-years and 94.1% of all pediatric hospital bed-years. We found numerous cases of rheumatic heart disease miscoded as acute rheumatic fever, and these were not analyzed further. There were 46 cases with a discharge diagnosis of "rheumatic fever," "acute rheumatic fever," "rheumatic carditis," "polyarthritis" and "Sydenham's chorea." Of these, 27 cases fulfilled the revised Jones criteria, 9 were classified as possible cases and 10 were clearly not rheumatic fever. Of the nine possible cases, none had definite carditis, four had definite polyarthritis and five had no major manifestations. Of the 27 confirmed cases, 6 patients resided outside the San Fernando Valley. Only 1 of the 21 residing in the San Fernando Valley was found through the three large teaching hospitals outside of the area. Four of the 27 cases were recurrences.

The overall incidence of acute rheumatic fever, based on

the 21 cases of San Fernando Valley residents, was 0.21 cases per 100,000 population for all ages. The age-adjusted rate for 5 to 17 year olds was 0.63 cases per 100,000. The primary attack rate was 0.17 per 100,000 and the recurrence rate 0.04 per 100,000. Table 1 puts these data into perspective by comparing them with those of major studies done on acute rheumatic fever incidence in the continental United States.<sup>6-12,15</sup> Data from the original articles have been adjusted to include only inpatients who fulfilled the Jones criteria.

Of San Fernando Valley residents, 44% live in communities with median family incomes above \$18,000 a year, but they had only 24% of cases of acute rheumatic fever (5/21). The other 56% had 76% (16/21) of the cases ( $P = .06$ ). Figure 1 shows that communities with more than 15% Hispanics, which include 52% of San Fernando Valley residents, had 76% of cases of acute rheumatic fever (16/21). The remaining 48% of residents had only 24% of the cases ( $P < .05$ ).

More interesting than the expected results of a higher incidence of acute rheumatic fever among lower socioeconomic groups is the degree of that difference. The ethnic breakdown of the San Fernando Valley is white 79.1%, Hispanic 15.5%, black 2.2%, Asian and other 3.1%.<sup>16</sup> Of our 21 cases of San Fernando Valley residents, 9 (43%) were white, 10 (48%)

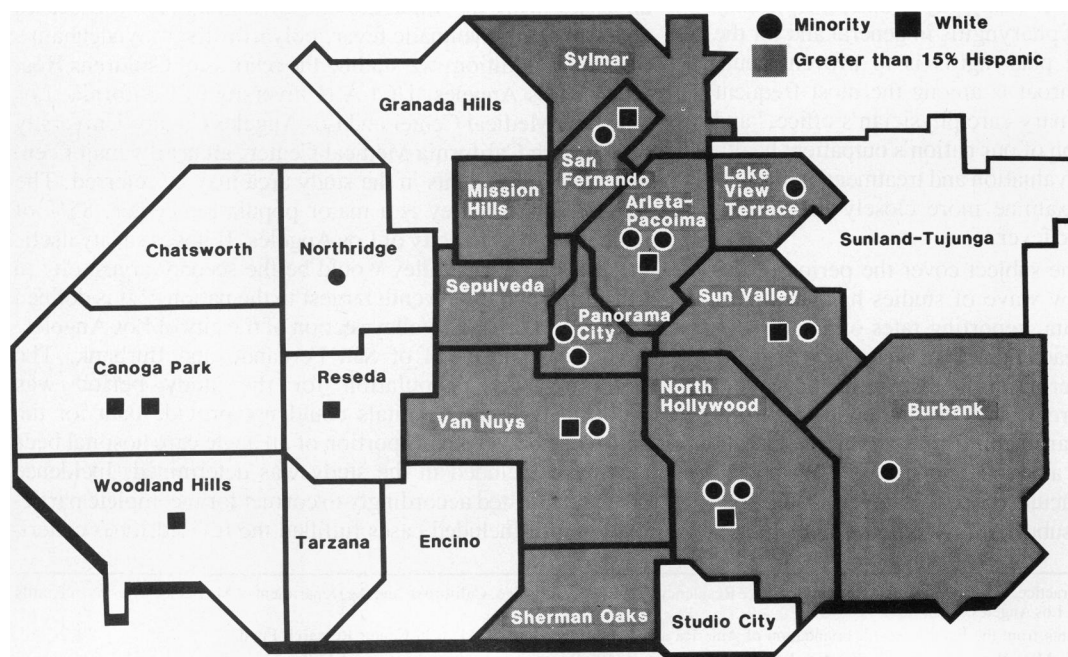


Figure 1.—Cases of acute rheumatic fever treated in hospital by community, by areas of greater than and less than average Hispanic population and by ethnic group in the San Fernando Valley, 1971 through 1980.

# ACUTE RHEUMATIC FEVER

TABLE 2.—Comparison of the Incidence of Acute Rheumatic Fever in White and Ethnic Minorities, in Major Studies on the Disease in Continental United States, Using a Ratio of White to Minority Groups

Location	Years of Study	White to Minority Group
Baltimore, Md . . . . .	1960-1964	1:2.5 (black)
Nashville, Tenn . . . . .	1963-1969	1:2.0 (black)
Mississippi . . . . .	1964-1973	1:1.6 (black)
San Fernando Valley, Calif . . . . .	1971-1980	1:5.5 (Hispanic)
Memphis-Shelby County, Tenn . . . . .	1977-1981	1:7.2 (black)

TABLE 3.—Analysis of Cases of Acute Rheumatic Fever By Major Manifestation of Jones Criteria\* in San Fernando Valley

Major Manifestations	Patients (N = 27)	
	Number	Percent
Carditis only . . . . .	3	11
Polyarthritis only . . . . .	16	59
Chorea only . . . . .	2	7
Carditis plus polyarthritis . . . . .	2	7
Carditis plus chorea . . . . .	1	4
Carditis plus polyarthritis plus erythema marginatum . . . . .	1	4
Carditis plus polyarthritis plus erythema marginatum and nodules . . . . .	1	4
Polyarthritis plus erythema marginatum . . . . .	1	4

\*From Committee Report in *Circulation*.<sup>14</sup>

TABLE 4.—Analysis of Cases of Acute Rheumatic Fever By Major Manifestations of Jones Criteria\* by Ethnic Group in the San Fernando Valley

Total Cases	Total 27	White 13	Minority† 14
Carditis . . . . .	8	1	7
(Severe carditis) . . . . .	(3)	(0)	(3)
Polyarthritis . . . . .	21	11	10
Erythema marginatum . . . . .	3	0	3
Chorea . . . . .	3	1	2
Subcutaneous nodules . . . . .	1	0	1
Number of major manifestations per patient . . . . .	1.3	1.0	1.6

\*From Committee Report in *Circulation*.<sup>14</sup>

†12 Hispanics, 1 black, 1 Filipino.

Hispanic, 1 (5%) black and 1 (5%) Asian. The disparity between whites and Hispanics is most clearly seen in the overall incidence of 0.12 cases per 100,000 non-Hispanic whites versus 0.66 per 100,000 Hispanics, a ratio of 1:5.5. In previous studies reporting the incidence in whites and ethnic minorities, only a recent study by Land and Bisno is in this range (Table 2).<sup>6,7,9,11</sup> Acute rheumatic fever in the San Fernando Valley even in very low numbers continues to be a disease of the poor and of ethnic minority groups.

Evaluation of all 27 cases as to the major manifestations of the Jones criteria shows an unusually low rate of carditis (8/27 or 30%). Conversely, we found a high rate of polyarthritis (21/27 or 78%). Chorea was found in 11% of cases (3/27), erythema marginatum in 11% (3/27) and subcutaneous nodules in 3% (1/27). Nonspecific rashes were not counted as erythema marginatum. The three cases having erythema marginatum were each thought to be such by the attending physician. In all, 78% (21/27) of patients had only one major manifestation, while 15% (4/27) had two and 7% (2/27) had three or more. Table 3 classifies all patients by major manifestations. A surprisingly high 59% (16/27) of cases had polyarthritis alone as a major manifestation, while 11% (3/27) had carditis alone. Four (15%) had both carditis and polyarthritis. Many studies report the incidence of "severe carditis," which usually includes cardiomegaly, congestive heart failure, pulmonary edema or pericarditis.<sup>5,7,9,11,12,15,17-20</sup> Of our eight cases of carditis, three had severe carditis (two cardiomegaly, one pulmonary edema).

The discrepancy between whites and minorities is again seen in Table 4. It shows that every white patient had but a single major manifestation, while minorities averaged 1.6 per patient. With respect to the most feared of these, carditis, whites had one case versus seven cases in minorities. Even though whites comprised nearly 80% of the population, they had only 43% (9/21) of all acute rheumatic fever cases and only 14% (1/7) of the carditis cases. The ethnic minorities in the San Fernando Valley comprised 21% of the population, had 57% (12/21) of all cases of acute rheumatic fever, 86% (6/7) of the cases of carditis and 100% (3/3) of the cases of severe carditis. Hispanics make up 10 of 12 minority-group patients in San Fernando Valley residents and 12 of 14 overall. No previous study has compared the rate of carditis

TABLE 5.—Number of Cases of Carditis and Severe Carditis, By Ethnic Group Where Available, in Studies of Acute Rheumatic Fever

Study	Carditis Total*			Severe Carditis*		
	Total	White	Minority Group	Total	White	Minority Group
	Percent	Percent	Percent	Percent	Percent	Percent
Feinstein et al, 1964 <sup>18</sup> . . . . .	49 216/441	...	...	17 75/441	...	...
Ekelund et al, 1967 <sup>17</sup> . . . . .	...	...	...	11 12/105	11 12/105	...
Brownell and Bailen-Rose, 1973 <sup>5</sup> . . . . .	48 127/265	...	...	4 14/347	...	...
Quinn and Federspiel, 1974 <sup>7</sup> . . . . .	42 132/312	33 70/210	61 62/102 (black)	...	...	...
Tamer, 1974 <sup>19</sup> . . . . .	55 54/98	...	...	33 32/98†	...	...
Coulehan et al, 1980 <sup>15</sup> . . . . .	55 83/150	...	55 83/150 (Navajo)	...	...	...
Powell and Watson, 1981 <sup>11</sup> . . . . .	...	...	(black)	35 115/325	16 23/144	51 92/181
Schwartz et al, 1983 <sup>12</sup> . . . . .	56 13/23	...	...	22 5/23	...	...
Land and Bisno, 1983 <sup>9</sup> . . . . .	54 22/41	...	...	12 5/41	...	...
Tolaymat et al, 1984 <sup>20</sup> . . . . .	78 100/128	64 39/61	91 61/67 (black)	41 53/128†	33 20/61	49 33/67
Chun et al, 1984 <sup>21</sup> . . . . .	41 43/104	7 1/14	46 42/90 (Polynesian)	...	...	...
Odio, this study . . . . .	30 8/27	8 1/13	50 7/14 (Hispanic)	11 3/27	0 0/13	21 3/14

\*Percentage, with number of cases of carditis per those of acute rheumatic fever.

†Includes category labeled "moderate carditis" by authors, but defined to include manifestations generally considered "severe" by other authors.

TABLE 6.—*Recurrent Cases of Acute Rheumatic Fever (ARF) as a Percentage of All Cases in Major US Studies*

Study Group and Location	Total ARF Cases in Study Number	% Recurrent	Age Group
Gordis et al, <sup>6</sup> Baltimore, Md . . . . .	186	15	5-19 yr olds
Coulehan et al, <sup>15</sup> Navajo Reservation . . . . .	229	20	all ages
Brownell and Bailen-Rose, <sup>5</sup> Manhattan (New York City) . . . . .	373	20	5-14 yr olds
Annegers et al, <sup>8</sup> Rochester, Minn* . . . . .	88	22	all ages
Quinn and Federspiel, <sup>7</sup> Nashville, Tenn . . . . .	324	19	all ages
Powell and Watson, <sup>11</sup> Mississippi . . . . .	334	20	all ages
Tamer, <sup>19</sup> South Florida . . . . .	98	21	all ages
Odio, this study, San Fernando Valley . . . . .	27	15	all ages
Land and Bisno, <sup>9</sup> Memphis-Shelby County, Tenn . . . . .	41	17	all ages
Chun et al, <sup>21</sup> Oahu, Hawaii . . . . .	104	13	4-18 yr olds

\*1950 to 1978 data only.

or the incidence of acute rheumatic fever between Hispanics and other whites. Table 5 reviews the major studies that report rates of carditis, severe carditis or both and includes those few studies that break down the data by ethnic group.<sup>5,7,9,11,15,17-21</sup> All 27 cases are entered in Table 5.

There was at least one case in each year of the study and the distribution of cases was unremarkable except in 1978, when a small clustering of five cases occurred, all in Hispanics, but in four separate cities, and the patients were admitted to four different hospitals. There were no differences between white and minority group patients with acute rheumatic fever with respect to predisposing factors (family history of acute rheumatic fever, untreated recent pharyngitis, history of heart murmur). White and minority group patients had a similar age distribution: range, 6 to 31 years in whites and 6 to 35 years in minorities; mean age, 14.8 in whites, 15.1 in minorities; 77% of whites (10/13) were younger than age 20, whereas 79% of minority group patients were younger than 20 (11/14).

Only six cases of acute rheumatic fever in the San Fernando Valley were reported to the health department during the study period. We obtained enough information on five of the six to find the patient charts (Michael Tormey, MPH, Epidemiologist, County of Los Angeles, Department of Health Services, written communication, May 18, 1983). Two of the five did not fulfill the Jones criteria. Of the three that did, we would not have otherwise found one case as it did not appear on the hospital's discharge log as rheumatic fever, chorea or polyarthritis. This case was, of course, added to the study. Using the health department number of six cases, despite some overreporting, would have underestimated the actual number found by a factor of 4.5.

While the number of our cases is small, it is interesting that the percentage of cases that were recurrences is 15% (4/27). Table 6 shows that all major studies in the US report that 13% to 22% of their cases are recurrences, despite different populations in different parts of the country at different times since the 1950s.<sup>5-9,11,15,20,21</sup> This suggests that patients with a history of acute rheumatic fever are benefiting proportionately to the general population from the decreasing incidence of the disease, and the percentage of the ever-decreasing total number of acute rheumatic fever cases is relatively constant over time. Also noteworthy is that all four of our recurrent cases belong to ethnic minorities (three Hispanic, one black).

The four all had polyarthritis and none had carditis. None of the 27 patients had any additional hospital admissions for acute rheumatic fever in any San Fernando Valley or referral center hospital, with an average follow-up time of 5.7 years.

### Discussion

The incidence of acute rheumatic fever found in this study is among the lowest reported in the world literature to date. Collins's analysis of the National Health Survey and the Communicable Disease Study of 1936 gives a historical perspective. He found 95 cases per 100,000 in 5 to 19 year olds and 41 cases per 100,000 overall.<sup>22</sup> Gordis and co-workers reported on cases of acute rheumatic fever in Baltimore from 1960 to 1964.<sup>6</sup> Reviewing hospital discharge records, they found 413 cases, 76.3% of which fulfilled the Jones criteria. Incidence rates were based on 270 patients who resided in Baltimore. They report 24 cases per 100,000 total incidence in 5 to 19 year olds, on the basis of 15.6 inpatient "Jones-positive" cases—that is, fulfilling the Jones criteria—per 100,000, plus an estimated 8.4 additional outpatient cases based on a questionnaire. Quinn and Federspiel studied metropolitan Nashville, Tennessee, from 1963 to 1969, finding 16.7 cases per 100,000 in 5 to 19 year olds when adjusted to include only Jones-positive inpatient cases.<sup>7</sup> Their rate for all ages is reported at 10.8 per 100,000, but is 6.7 per 100,000 for Jones-positive inpatient cases, which is similar to the 4.6 per 100,000 calculated figure for the study by Gordis and associates.<sup>6</sup> Quinn and Federspiel were the first to document a higher rate of carditis among blacks, reporting 33% carditis in whites with acute rheumatic fever versus 61% in blacks.<sup>7</sup>

Brownell and Bailen-Rose studied part of New York City from 1963 to 1965.<sup>5</sup> Unfortunately for attempts at comparisons, no distinction was made between inpatients and outpatients, and no information as to which cases fulfilled the Jones criteria was provided. A very high incidence (61 per 100,000) was found in what is roughly a 5- to 14-year-old population. They found even higher attack rates in tracts with a high Puerto Rican population, but did not have the data on the ethnic group of individual patients to determine accurate rates. The difference in methodology from most other major studies makes these results difficult to interpret.

Powell and Watson studied the state of Mississippi.<sup>11</sup> Other projects done on entire states have depended on surveys of medical records, questionnaires or both, all without chart reviews.<sup>23-25</sup> They provide general data, but are highly inac-

curate. Powell and Watson accumulated data on 81% of hospital bed-years from 1964 to 1973. Only 361 out of 645 reported cases were found on analysis to be acute rheumatic fever. They documented a low 1.9 per 100,000 cases for all ages and 4.6 per 100,000 for 5 to 19 year olds. While not reporting an overall carditis rate, they did report that severe carditis occurred in 51% of blacks, but only 16% of whites.

Coulehan and colleagues studied the Navajo Reservation from 1962 to 1977.<sup>15</sup> As the only researchers to study a strictly minority group population, their finding of relatively high rates is not surprising. They report an overall rate of 12.4 inpatient cases of acute rheumatic fever per 100,000, which appears to be nearly twice that reported by Quinn and Federspiel (6.7 per 100,000 overall).<sup>7</sup> But a breakdown of Quinn and Federspiel's data shows 11.1 per 100,000 among blacks. The rate by Coulehan and co-workers of 20.9 cases per 100,000 in 5 to 19 year olds is actually less than that calculated from Quinn and Federspiel's data in blacks for this age range (27.3 per 100,000), and less than Gordis and associates' figure for this group (24.4 per 100,000).<sup>6,7,15</sup>

Annegers and colleagues reported on Rochester, Minnesota, dividing the study into three time periods: 1935 to 1949, 1950 to 1964 and 1965 to 1978.<sup>8</sup> Though their population base was very small, they documented age-adjusted overall rates, including outpatients, of 20.6, 12.0 and 3.0, respectively, per 100,000 population per year in these periods.

Land and Bisno reported the incidence of acute rheumatic fever for Memphis-Shelby County, Tennessee, from 1977 to 1981, attempting to find all cases, both inpatient and outpatient, by hospital chart reviews and by mail survey of physicians.<sup>9</sup> Only three possible outpatient cases were identified, and none was found to fulfill the Jones criteria. The reported rate of 0.64 cases per 100,000 was tenfold less than neighboring Nashville 12 to 14 years earlier.<sup>7</sup> Even inner-city blacks had an incidence of only 1.63 per 100,000. The overall incidence in blacks was 1.23 per 100,000, while in whites it was 0.17 per 100,000. In another five-year review (1976 to 1980), Holmberg and Faich studied the incidence of acute rheumatic fever in Rhode Island.<sup>10</sup> They found that hospital discharge records showed 141 cases of acute rheumatic fever or chorea, and a mail survey of physicians yielded 51 reports of cases. Chart reviews, however, elicited only three cases that met the revised Jones criteria, and thus the calculated incidence of Jones-positive cases of acute rheumatic fever in the state is a remarkably low 0.07 per 100,000 overall and 0.23 per 100,000 in 5 to 17 year olds.

Chun and co-workers recently reported on acute rheumatic fever on Oahu, Hawaii, from 1976 through 1980 in children 4 to 18 years old.<sup>21</sup> They determined the rate of acute rheumatic fever for each ethnic group on the island, but their population base was small (Hawaiians 45,900, whites 39,100, Japanese 24,600, Samoans 4,700 and so forth, with a total population of 180,200). Whereas no cases of acute rheumatic fever were reported in Japanese children, at the other extreme, Samoan children had a staggering rate of 96.5 cases per 100,000.

In a middle-class community study of children, Schwartz and co-workers found a declining rate of inpatient cases of acute rheumatic fever treated in hospital in Fairfax County, Virginia, from 1970 through 1980.<sup>12</sup> Only 4 of 23 cases occurred from 1975 to 1980. The calculated rate for the entire

period is 1.14 per 100,000 (0 to 18 year olds). All cases were from a single hospital, but an effort was made to find cases throughout the county. Gordis recently referred to an unpublished study of Baltimore from 1977 to 1981 showing that the incidence of "first attacks of rheumatic fever . . . have dropped markedly to approximately 0.5 per 100,000 children aged 5 to 19 for both whites and blacks."<sup>26</sup>

Two Florida studies did single-hospital case reviews, which are thus not incidence studies.<sup>19,20</sup> Tamer in south Florida reviewed 98 cases from 1957 to 1971, finding clinical manifestations similar to those in most series. Tolaymat and associates in north Florida reviewed 128 cases from 1962 through 1980, finding a large percentage having carditis, which is not unexpected in their selected, medically indigent population (Table 5). They found no decline in admissions for acute rheumatic fever over time, but blacks became an ever greater proportion of the total cases, despite no similar change in ethnic group of admissions in general.

The pattern of clinical manifestations in our study raises some questions. Land and Bisno, for example, had rates of carditis (54%) and polyarthritis (61%) comparable to those of most other studies.<sup>5,15,18</sup> In contrast, our series showed only 30% with carditis but 78% with polyarthritis. Only 16% of Land and Bisno's cases had polyarthritis as the sole major manifestation, in sharp contrast to our 59%. There may be milder clinical manifestations of acute rheumatic fever in the San Fernando Valley than in other parts of the country, or we may be dealing with a higher number of false-positives. Though all our cases meet the revised Jones criteria, including evidence of a recent streptococcal infection, this does not prove that the cases are acute rheumatic fever. As Land and Bisno pointed out, the weak point in the Jones criteria is with polyarthritis as the sole major manifestation. If one postulates an incidence of 0.05 to 0.1 per 100,000 background cases of other than acute rheumatic fever that will fulfill the Jones criteria, the effect on a study like Land and Bisno's with an incidence of 0.64 cases of acute rheumatic fever per 100,000 would be too small to detect. In a study with as low an incidence as ours, however, one would expect to have background cases skew results so that there is less carditis and more polyarthritis than expected. This is precisely the case in our study. In fact, if we eliminate a third of our cases (reducing our incidence by 0.07 per 100,000), dropping only cases with polyarthritis, our carditis rate would be 44% (8/18) and polyarthritis 67% (12/18). These percentages would be more in line with results from other studies. A review of Table 4 indicates that most of the cases dropped would come from white patients, where 11 of 13 cases of acute rheumatic fever are based on polyarthritis as the sole major manifestation.

Whites had 13 primary and no recurrent cases of acute rheumatic fever in our study. Minority group patients had ten primary and four recurrent cases. The lack of recurrent cases among whites might be due to a milder form of the disease. Another explanation consistent with the hypothesis of a high rate of false-positives among whites is that they had no recurrences because so few truly get the disease to begin with.

The study by Chun and co-workers, though hampered by a small population base, does not lend support to a uniform incidence of background false-positive cases for all geographic areas.<sup>21</sup> They found a low carditis rate in whites compared with Polynesians (Table 5) despite a relatively high

incidence of acute rheumatic fever in whites (9 per 100,000 in 4 to 18 year olds). Again, this could be due to a milder form of the disease among whites, or to false-positive cases occurring at a higher background rate than in our area.

The rate of outpatient cases in the previous studies varies from 0% to 36%.<sup>6,7,9-11</sup> Methodologically, the best study was that of Quinn and Federspiel, who found 21% (54/255). Two recent studies, though dealing in small numbers, found 0% (Land and Bisno, 0/41, Holmberg and Faich 0/3).<sup>9,10</sup> We did not find any outpatient cases, but did not search for them in a comprehensive enough manner to be confident that there were none. Because of uncertainty regarding the possibility of outpatient cases, we are reporting our incidence as being that of inpatient cases only.

### Conclusion

Clearly, the incidence of acute rheumatic fever is exceedingly low in the San Fernando Valley section of Los Angeles. This information strengthens the findings of recent studies in Rhode Island, Tennessee and elsewhere and forces us to re-evaluate our strategies about preventing acute rheumatic fever.<sup>9,10,12,27(pp20-24)</sup> An unpublished survey of physicians in the San Fernando Valley shows the main reason physicians offer for treating streptococcal pharyngitis is to prevent acute rheumatic fever. Is this justified in a non-Hispanic white living in the San Fernando Valley, where in nearly 8 million patient-years we could find only nine cases of acute rheumatic fever requiring admission to hospital, only one patient of whom had carditis and a nonsevere form, at that? Though our numbers are small and should be interpreted cautiously, we found a minority group patient to have a fivefold greater chance of acute rheumatic fever developing and a 23 times greater chance of the disorder developing with carditis than would a white patient. Thus, an easily identifiable factor, ethnic group, has enormous effects on a patient's risk for this disease in our area. We also have found an incidence so low that the threshold where background cases become a significant proportion of all cases may have been reached. Great caution should be exercised in communities with a similarly low incidence when making the diagnosis of acute rheumatic fever when polyarthritis is the sole major manifestation.

Before interpreting these data to mean that we should stop doing throat cultures or stop treating streptococcal pharyngitis, there are other factors to consider. First, we do not know the mechanism of the decline in acute rheumatic fever, nor how much of a role our antibiotic usage has played in this. Second, "strep throat" causes suppurative complications, including peritonsillar abscess, otitis media, sinusitis and mastoiditis, and the current rate and severity of suppurative complications in untreated patients with streptococcal pharyngitis is unknown. Third, patient discomfort from pharyngitis varies from minimal symptoms to a toxic state. Patients go to physicians with a sore throat not to prevent rheumatic fever, but primarily to find a way to alleviate symptoms. Whether the treatment with antibiotics of streptococcal pharyngitis changes its clinical course is an unresolved debate with many prominent opponents and proponents.<sup>27(pp 80-81), 28-33</sup> Even if antibiotics do provide symptomatic relief to the patient, we do not even know if aspirin would do as well.

Further information is needed about the consequences of not treating with antibiotics, treating more selectively or using a shorter course of treatment with respect to complica-

tions and to a patient's symptomatic and functional course. Until such studies, some of which are in progress, are completed, we may question our previous beliefs and practices, but controversy will persist regarding the best way to diagnose and treat streptococcal pharyngitis.

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